

George Mason University
College of Education and Human Development
Secondary Education Program

College of
EDUCATION HUMAN DEVELOPMENT 



Promoting Learning  Development Across the Lifespan

EDCI 670
ADVANCED METHODS OF SCIENCE TEACHING
Spring Semester, 2015

Instructor: Len Annetta, Ph.D.
Date and Time: Monday 4:30-7:10
Class Location: Robinson Hall A 352
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COURSE DESCRIPTION

Application of major principles of education and psychology for the improvements of science teaching in secondary schools.

GOALS

This course will focus on augmenting the knowledge of experienced science teachers by integrating the reading of current literature in education research that defines best practice with the application of these findings in the educational setting. The course will build on science teachers' existing knowledge and reflect on what it means to teach science, what it means to teach a diverse population of students and how to develop, implement, and interpret authentic assessment [ie. product based assessment such as portfolios]. Participants will engage in action research to evaluate the instructional impact of these modifications (impact on student learning).

These interpretations will be viewed in terms of current learning theory and framed using a constructivist philosophy [This is the predominant philosophy of the science education community and is based on the premise that knowledge is actively constructed by the learner).

GOALS- AS A RESULT OF THIS COURSE, SCIENCE TEACHERS WILL BE ABLE TO:

- Design and modify instruction based on theory, philosophy, educational research, and best practice.
- Incorporate findings from educational literature into instructional strategies to improve student learning.
- Create a learning environment in which all learners feel welcome and can be successful.
- Modify instruction and learning environment based on assessment of student learning problems and successes.
- Seek, implement, and evaluate best pedagogical practice within the context of a specific learning setting.
- Monitor the effects of instructional actions, selection of learning materials, and other instructional decisions on students' learning.
- Design and modify instruction that is responsive to differences among learners.

REQUIRED TEXT RESOURCES

- Will be provided electronically by the instructor on the Blackboard site.
- Because this course is flexible to the needs of the in-service science teachers, other articles/handouts than the ones indicated on this syllabus may be distributed in class or posted on-line at the course website.
- It is expected that the readings assigned for the class will be completed before the class meeting.

RECOMMENDED TEXT RESOURCES

- Bell, R., Gess-Newsome, J. & Luft, J. (2008). *Technology in the secondary science classroom*. Arlington, VA: NSTA Press.
- Liu, X. (2010). *Essentials of science classroom assessment*. Washington, DC: Sage Publications.
- Tomlinson, C. A. (2005). *How to differentiate instruction in mixed-ability classrooms*. Upper Saddle, NJ: Pearson.
- Keeley, P. (2008). *Science formative assessment: 75 practical strategies for linking assessment, instruction, and learning*. Arlington, VA: NSTA Press.
- Nitko, A. J. & Brookhart, S. M. (2007). *Educational assessment of students*. Upper Saddle River, NJ: Pearson

ONLINE RESOURCES

- Commonwealth of Virginia (2003). *Standards of Learning for Virginia Public Schools*. http://www.doe.virginia.gov/testing/sol/standards_docs/science/index.shtml
- Commonwealth of Virginia (2003). *Science Standards of Curriculum Framework Guides*. http://www.doe.virginia.gov/testing/sol/standards_docs/science/index.shtml

- National Science Teachers' Association. *Science Class* newsletter. <http://www.nsta.org/publications/enewsletters.aspx>.
- American Association for the Advancement of Science (1993). *Benchmarks for Science Literacy*. <http://www.project2061.org/tools/benchol/bolframe.htm>.
- National Academies Press (1996). *Classroom Assessment and the National Science Education Standards*. http://www.nap.edu/catalog.php?record_id=9847

Other articles/handouts will be distributed in class or posted on-line at the course website. (Your GMU email address is required for communication with the course instructor and for using Blackboard!)

RESOURCES FOR CLASS ASSIGNMENTS

Classroom Management

Padilla, M. Capie, W., & Cronin, L. (1986, March) The relationship of teacher performance to science process skill achievement of students. Paper presented at the annual meeting of the National Association for Research in Science Teaching, San Francisco.

Note: This reading represents core knowledge in the field, thus the older publication date.

Cooperative Learning

Bianchini, J. (1997). Where knowledge construction, equity, and context intersect: student learning of science in small groups. *Journal of Research in Science Teaching*, 34(10), 1039-1065.

Clarke, J. (1994). Pieces of the puzzle: the jigsaw method. In Sharan, S.(Ed) *Handbook of Cooperative Learning Methods* 82-96. Westport, CT: Greenwood Press.

Cohen, E., Lotan, R., Whitcomb, J., Balderrama, M., Cossey, R., and Swanson, P. (1994). Complex instruction: higher order thinking in heterogenous classrooms. In Sharan, S.(Ed) *Handbook of Cooperative Learning Methods* 82-96. Westport, CT: Greenwood Press.

Grisham, D. L., & Molinelli, P. M. (1995). Cooperative Learning. Westminster, CA: Teacher Created Materials, Inc.

Humphreys, B. Johnson, R. & Johnson, D. (1982). Effects of cooperative, competitive, and individualistic learning on students' achievement in science class. *Journal of Research in Science Teaching*, 19(5), 351-356.

Johnson, D., & Johnson, R. (1994) *Learning Together and Alone: Cooperative, Competitive, and Individualistic Learning*. (4th ed). Needham Heights, MA: Allyn and Bacon.

Lumpe, A., Staver, J. (1995). Peer collaboration and concept development: Learning about photosynthesis. *Journal of Research in Science Teaching*, 32(1), 71-98.

Okebukola, P. (1985). The relative effectiveness of cooperative and competitive interaction techniques in strengthening students' performance in science classes. *Science Education*, 69(4), 501-509.

Okebukola, P. (1992). Concept mapping with a cooperative learning flavor. *American Biology Teacher*, 54(4) 218-221.

Sharan, Y., & Sharan, S. (1990). Group investigation expands cooperative learning. Educational

Leadership, 47(4), 17- 21.

- Sherman, L. (1988). A comparative study of cooperative and competitive achievement in two secondary biology classrooms: the group investigation model versus an individually competitive goal structure. *Journal of Research in Science Teaching*, 26(1) pp55-64.
- Shulman, J. Lotan, R., and Whitcomb, J.(Eds) (1998) *Groupwork in Diverse Classrooms: A Casebook for Educators*. NY: Teachers College Press.
- Slavin, R., (1994) *Student Teams- Achievement Divisions*. In Sharan, S.(Ed) *Handbook of Cooperative Learning Methods* 82-96. Westport, CT: Greenwood Press.
- Watson, S. (1991). Cooperative learning and group educational modules: effects on cognitive achievement of high school biology students. *Journal of Research in Science Teaching*, 28(2), 141-146.
- Watson, S. (1992). The essential elements of cooperative learning. *The American Biology Teacher*, 54(2), p84-86.

Inquiry

- Haury, David L. (1993). *Teaching Science Through Inquiry* ED359048 93 ERIC/CSMEE Digest (http://www.ed.gov/databases/ERIC_Digests/ed359048.html)

Learning Cycles

Could start with reading p 76-79 of *Handbook of Research on Science Teaching and Learning* ed Gabel, D.L. (1994) - many other studies are described.

Westbrook, S. and Rogers, L. (1996), Expanded perspectives on the learning cycle. *NCSTA Journal*, p. 41-48.

Positive Reinforcement

Brophy, J. E. (1981). Teacher praise: A functional analysis. *Review of Educational Research*, 51, 5- 32.

Note: This reading represents a broad review of the literature, thus the older publication date.

Questioning

Penick, J., Crow, L., & Bonnstetter, R. (1996). Questions are the answer. *The Science Teacher*, 63(1), 26- 29.

Wait time

Rowe, M. B. (1986). Wait time: Slowing down may be a way of speeding up! *Journal of Teacher Education*, 37(1), 43- 50.

Rowe, M. B. (1974). Relation of wait-time and rewards to the development of language, logic, and fate control: Part II- rewards. *Journal of Research in Science Teaching*, 11(4), 291-308.

Rowe, M. B. (1974). Wait time and rewards as instructional variable, their influence on language, logic, and fate control: Part One - wait- time. *Journal of Research in Science Teaching*, 11(2), 81- 94.

General

Rosenshine, B. (1985). Direct instruction. In T. Husen & T. Postlethwaite (Eds.), *International encyclopedia of education* (pp. 1395-1400). Oxford, England: Pergamon Press.

Tobin, K., & Fraser, B. J. (1990). What does it mean to be an exemplary science teacher? *Journal of Research in Science Teaching*, 27(1), 3- 25.

Walberg, H. (1988). Synthesis of research on time and learning. *Educational Leadership*, 45(6), 76- 81.

Note: The above 5 manuscripts represent historically important knowledge, thus the older

publication dates.

Wang, M.C., Haertel, G.D. & Walberg, H.J. (1993). Toward a knowledge base for school learning. Review of Educational Research, 63(3), 249-294

COURSE MATERIALS ONLINE

The Blackboard site can be found at <http://mymasonportal.gmu.edu>. Use the same login as your GMU email.

RELATIONSHIP TO PROGRAM GOALS AND PROFESSIONAL ORGANIZATIONS

EDCI 670 is the first course in a three-course sequence of Advanced Studies in Teaching and Learning science courses for students seeking an advanced M.Ed. (ASTL) or as a requirement for the Science Education Research PhD. The course builds on students' knowledge of their subject matter and from their current or former teaching experience. The course focuses on teacher as a reflective practitioner in science teaching and learning and meeting the diverse needs of learners as called for by the *Standards of Learning for Virginia Public Schools* and *National Science Education Standards* and as outlined by the National Council for Accreditation of Teacher Education (NCATE), the National Science Teachers Association (NSTA), and the Interstate New Teacher Assessment and Support Consortium (INTASC). EDCI 670 introduces students to action research in learning and teaching science, adapting inquiry-based lessons, assessment techniques, and the diverse needs of students. This course will also be directly connected to the Core Values of CEHD: Innovation, Research-Based Practice, Ethical Leadership, Social Justice and Collaboration.

These position statements indicate that the core knowledge expectations in science education include:

- Vary their teaching actions, strategies, and methods to promote the development of multiple student skills and levels of understanding.
- Successfully promote the learning of science by students with different abilities, needs, interests, and backgrounds.
- Successfully organize and engage students in collaborative learning using different student group learning strategies.
- Successfully use technological tools, including but not limited to computer technology, to access resources, collect and process data, and facilitate the learning of science.
- Understand and build effectively upon the prior beliefs, knowledge, experiences, and interests of students.
- Create and maintain a psychologically and socially safe and supportive learning environment.

Additionally, this course was designed with a vision for accomplished teaching, as indicated by NBPTS Science Standards for Early Adolescence

(http://www.nbpts.org/userfiles/File/ea_science_standards.pdf) and Adolescence and Young

Adulthood (http://www.nbpts.org/userfiles/File/aya_science_standards.pdf) the Five Core Propositions of the National Board for Professional Science Teaching:

- Proposition 1: Teachers are Committed to Students and Their Learning
- Proposition 2: Teachers Know the Subjects They Teach and How to Teach Those Subjects to Students
- Proposition 3: Teachers are Responsible for Managing and Monitoring Student Learning.
- Proposition 4: Teachers Think Systematically about Their Practice and Learn from Experience.
- Proposition 5: Teachers are Members of Learning Communities.

SUSTAINABILITY AT GMU

George Mason University is focusing on making our community “greener” and reducing the impact on the environment. This course will contribute to this effort in the following ways. I hope that you will create other ways to contribute to contribute to this effort.

- Handouts will be available electronically through the Blackboard 9.1 platform
- You should consider reducing waste in your teaching practice (ex: unnecessary paper) and in developing your work products for this class
- Incorporate teaching sustainability in the content of your lesson plans (for example, human’s role in reducing their impact on the environment.) Think about what the next generation needs to know about “greening”.

COMMUNICATION

If you would like to get in touch with me, email is the best form (lannetta@gmu.edu). During usual circumstances, turnaround time is 24-36 hours. Please don’t leave a message on my university phone, as the system is relatively unreliable.

COLLEGE EXPECTATIONS AND UNIVERSITY HONOR CODE

The Graduate School of Education (GSE) expects that all students abide by the following: Students are expected to exhibit professional behavior and dispositions.

Commitment to the profession

- Promoting exemplary practice
- Excellence in teaching and learning
- Advancing the profession
- Engagement in partnerships

Commitment to honoring professional ethical standards

- Fairness
- Honesty
- Integrity
- Trustworthiness
- Confidentiality
- Respect for colleagues and students

Commitment to key elements of professional practice

Belief that all individuals have the potential for growth and learning
Persistence in helping individuals succeed
High standards
Safe and supportive learning environments
Systematic planning
Intrinsic motivation
Reciprocal, active learning
Continuous, integrated assessment
Critical thinking
Thoughtful, responsive listening
Active, supportive interactions
Technology-supported learning
Research-based practice
Respect for diverse talents, abilities, and perspectives
Authentic and relevant learning

Commitment to being a member of a learning community

Professional dialogue
Self-improvement
Collective improvement
Reflective practice
Responsibility
Flexibility
Collaboration
Continuous, lifelong learning

Commitment to democratic values and social justice

Understanding systemic issues that prevent full participation
Awareness of practices that sustain unequal treatment or unequal voice
Advocate for practices that promote equity and access
Respects the opinion and dignity of others
Sensitive to community and cultural norms
Appreciates and integrates multiple perspectives

COLLEGE OF EDUCATION AND HUMAN DEVELOPMENT STATEMENT OF EXPECTATIONS:

All students must abide by the following:

- Students must adhere to the guidelines of the George Mason University Honor Code [See <http://academicintegrity.gmu.edu/honorcode/>].
- Students with disabilities who seek accommodations in a course must be registered with the George Mason University Office of Disability Services (ODS) and inform their instructor, in writing, at the beginning of the semester [See <http://ods.gmu.edu/>].
- Students must follow the university policy for Responsible Use of Computing [See <http://universitypolicy.gmu.edu/1301gen.html>].
- Students are responsible for the content of university communications sent to their George Mason University email account and are required to activate their account and

check it regularly. All communication from the university, college, school, and program will be sent to students solely through their Mason email account.

- Students must follow the university policy stating that all sound emitting devices shall be turned off during class unless otherwise authorized by the instructor.
- Students are expected to exhibit professional behaviors and dispositions at all times.

Please note that:

o “Plagiarism encompasses the following:

1. Presenting as one's own the words, the work, or the opinions of someone else without proper acknowledgment.
2. Borrowing the sequence of ideas, the arrangement of material, or the pattern of thought of someone else without proper acknowledgment.”

(from Mason Honor Code online at

<http://mason.gmu.edu/~montecin/plagiarism.htm>)

o Paraphrasing involves taking someone else’s ideas and putting them in your own words. When you paraphrase, you need to cite the source.

o When material is copied word for word from a source, it is a direct quotation. You must use quotation marks (or block indent the text) and cite the source.

o Electronic tools (e.g., SafeAssign) may be used to detect plagiarism if necessary.

o Plagiarism and other forms of academic misconduct are treated seriously and may result in disciplinary actions.

- Students must agree to abide by the university policy for Responsible Use of Computing. See <http://www.gmu.edu/facstaff/policy/newpolicy/1301gen.html>.

Click on responsible Use of Computing Policy at the bottom of the screen.

- Students with disabilities who seek accommodations in a course must be registered with the GMU Office of Disability Services (ODS) and inform the instructor, in writing, at the beginning of the semester. See <http://www2.gmu.edu/dpt/unilife/ods/> or call 703-993-2474 to access the ODS.

- The George Mason University Counseling and Psychological Services (CAPS) staff consists of professional counseling and clinical psychologists, social workers, and counselors who offer a wide range of services (e.g., individual and group counseling, workshops and outreach programs) to enhance students’ personal experience and academic performance [See <http://caps.gmu.edu/>].
- The George Mason University Writing Center staff provides a variety of resources and services (e.g., tutoring, workshops, writing guides, handbooks) intended to support students as they work to construct and share knowledge through writing [See <http://writingcenter.gmu.edu/>].

For additional information on the College of Education and Human Development, Graduate School of Education, please visit our website [See <http://gse.gmu.edu/>].

PROFESSIONALISM:

As a professional in the field of education, you need to take seriously your Responsibility for learning and helping others learn in this class. As a professional,

You should:

- Attend all classes
- Arrive on time and remain for the entire period
- Be prepared for each class by having thoughtfully completed all readings and assignments
- Keep me informed of any extenuating circumstances in your life that may hinder your ability to succeed in this course
- Remain on task during class sessions
- Respect others' opinions in the class
- Be curious about ideas different than your own

I take very seriously the idea that our class is a community of learners. It is important that everyone feels both encouraged to participate and a responsibility to participate.

All ideas are welcome including those that are different than my ideas and those of the majority of the class.

GRADING

Since this is a graduate level course, high quality work is expected on all assignments and in class. **Attendance at all classes for the entire class is a course expectation.** Each unapproved absence will result in a grade reduction of 2 points and each two-class lateness will result in a 2-point grade reduction. Each graded assignment will be assessed using a scoring rubric, which will be handed out before the assignment is due. The rubrics are available on the Blackboard website at the beginning of the semester. All assignments are due at the beginning of class on the day they are due. Graded assignments that are late will automatically receive a ten percent grade reduction (one full letter grade lower).

POLICY ON INCOMPLETES

If circumstances warrant, a written request for an incomplete must be provided to the instructor for approval prior to the course final examination date. Requests are accepted at the instructor's discretion, provided your reasons are justified and that 80% of your work has already been completed. Your written request should be regarded as a contract between you and the instructor and must specify the date for completion of work. This date must be at least two weeks prior to the university deadline for changing incompletes to letter grades.

GRADING SCALE

A 100 - 90 A -; 89 - 86 = B+, 85 - 83 = B; 82 - 80 = B - ; 79-70 C and 69 and below F

ASSIGNMENTS AND POINT VALUES

Science education research shows that frequent assessment of small amounts of material is most effective for learning science. Therefore, in this class formal and informal assessment will be continuously provided on assignments and class activities. Assessment is used as a tool for information that informs both learning and teaching, so this two-way communication loop is necessary for optimal learning. ALL assignments will be submitted online through Blackboard.

Hardcopies and email submissions will not be accepted. Of critical importance, make each project something that you will actually use in teaching.

ALTERNATIVE CONCEPTION PROJECT

Due: February 16, 20% of entire grade

This project has the following 4 components that will be assigned over the course of the semester:

1) Interview

- Interview 2-5 people about a science concept
- Audio/videotape interviews
- Transcribe illustrative sections
- Class Presentation
 - Provided class with overview of interviews
 - Described how interviewees were thinking about concept
 - Provide written reflection summarizing our findings

2) Assessment question/questions

Design an open-ended question and administer to at least 10 people.

Prepare a written reflection which evaluates your question using the following criteria:

- a. Does the question focus on an important concept, skill or idea?
- b. Does the question have a meaningful context for all students? (Does the assessment give an advantage to a group, ie. girls or boys?)
- c. Does the question require students to use and apply reasoning skills (conceptual understanding rather than just recall information.
- d. Does the question assess science content and skills as opposed to reading ability.
- e. Does the question have the potential to identify multiple levels of understanding and to identify specific areas of misunderstanding?
- f. Does the question allow for too broad a response range?

3) Assessment Rubric

- Develop an assessment rubric from piloted questions or interview
- Minimal - three levels of understanding
- Levels must be described in detail and in such a way that instructional interventions for each level may be written from rubric.

4) Instructional Intervention

From interview or from assessment questions identify a concept or a component of a concept that is difficult for students to understand. Develop an instructional activity that could be implemented to address such a misconception. Include:

- a) Identification of targeted concept
- b) Identification of common misconception
- c) Complete description of the instructional intervention. The strategy to be used will be of a problem based learning approach. Design a PBL activity that addresses the misconception, provides distracters, and rewards the student for attaining the answer to the problem.

After completion and feedback on the four components prepare the fifth component as follows and submit completed project.

5) Reflective overview of the project

- Give an introductory overview of the project
- Provide a rationale for the project
- Identify the targeted concept and targeted grade level.
- Explain what students at the targeted grade level should know about the concept.
- Provide a reflection on each of the artifacts
- Be written in such a way that you have documented your ability to do the following:
 - a) Develop an assessment with a rubric that can be used to identify students' developmental level
 - b) Illustrate knowledge of common misconceptions and instructional interventions for addressing those misconceptions
 - c) Your understanding of best practice as supported by theoretical and research bases.

Products & grading :

1. Reflective overview	40 points
2. Interview	10 points
3. Assessment Questions	10 points
4. Rubric	10 points
5. Instructional Intervention	30 points

DIVERSE LEARNERS PROJECT

DUE: April 13, 60% of entire grade

Select **ONE** of the following:

1. Unit plan – Change unit plan or develop unit plan so that it will be accessible for more students (remember to include assessments). Explicitly reflect on how the changes made make it more accessible. Cite any relevant current research. (A unit would consist of more than 5 lesson plans.) Expected reflection 2-3 pages in length, substantiating your plan.

Grading

Unit plan clearly outlines goals, objectives, instructional activities and assessments 50 points

Reflection provides clear rationale for changes and cites appropriate literature. 50 points

2. Select two different age groups. Devise a set of activities related to the same topic that would be appropriate for that age group (developmental level). Reflection should specifically cite the research and point out how the activities have been designed to address specific developmental levels.

Grading

Activities are clearly described and appropriate for designated age level
50 points

Reflection provides clear rationale for activities and cites appropriate literature.
50 points

3. Prepare a review of literature 6 - 8 pages (10 references minimum) on gender/ethnicity/diversity research.

Requirements:

Minimum of 5 articles

At least 4 articles must be published in research journals

APA formatting throughout

Includes the following sections

- Introductory sentence giving overview of review of literature
- Body of the review describing what at least five studies have found about the topic
- Concluding statement(s) summarizing findings cited
- Bibliography

Grading

Introduction clearly defines review 20 points

Summary cohesiveness 20 points

Quality of articles chosen 25 points

Clarity of writing 20 points

Adherence to APA style 6th edition 15 points

IMPROVING CLASSROOM INSTRUCTION PROJECT (Done in Pairs)

DUE : April 20, 20% of entire grade

The purpose of this assignment is to help you improve your use of effective teaching techniques and begin to document your work for your portfolio. We will use peer coaching which research supports as an effective method for promoting transfer of learning to actual classroom practice. (Joyce and Showers, 1995; Phillips and Glickman, 1991). This assignment is the designated Performance Based Assessment (PBA) for the course and should be uploaded to Task Stream.

Introduction: The products that make up this project will be assigned over the semester. The fundamentals of peer coaching, videotaping, coding and analyzing videotapes will be described in class.

Assignment :

1. Choose an effective teaching strategy for implementation
2. Find partner(s) with a similar interest.
3. Discuss with the partner how this area is important in your teaching and how you envision your improvement.
4. Document your current teaching with a lesson plan and video record.
5. Find two articles supporting the effective teaching strategy you intend to work on. (one per person)

6. Present articles to the class.
7. Choose an appropriate observation instrument.
8. Watch your video with your partner(s)- both use observation instrument.
9. Discuss possible improvements. Develop Improvement Plan.
10. Implement improvement plan.
11. Video another lesson for documentation of improvement.
12. Use same observation instrument to analyze
13. Summarize experience for the class.

Products & Grading:

- | | |
|---|-----------|
| 1. Current teaching video recording, observation and analysis | 30 points |
| 2. Presentation of research to class | 20 points |
| 3. Improvement Plan | 10 points |
| 4. 2nd teaching videotape, observation and analysis | 30 points |
| 5. Summary of experience for class | 10 points |

Alternative Assignment for non-classroom students

Document exemplary science teaching:

1. Find a teacher to work with: could be college, K-12, or informal depending on your focus. Get permission from school, parents, to videotape classes.
2. Choose mode: Inquiry, learning cycle, cooperative learning. Although exemplary direct (lecture) mode may exist do not choose it for this assignment.
3. Review several sources on this method including both research papers and how-to sources written for teachers
4. Present summary of findings from literature
5. Conduct preconference with teacher where he/she explains lesson plan
6. Video lesson, observe and analyze video
7. Analyze elements of lesson - what made it successful, is it in fact an exemplar of this mode, relate to research literature on this mode of instruction.
8. Write paper 5-8 pages summarizing research literature and your analysis.
9. Summarize experience for class.

Reflection Questions:

1. What teaching behavior are you focusing on?
Why is this an important teaching behavior? -(address context of lesson, students)
2. Context - this lesson
What were you teaching ? Main concept - objectives
Who? Describe students - especially factors that relate to chosen focus
3. Analyze the data collected: Describe the data collected. Relate it to the desired behavior for this lesson. Be sure to include the data collected on the observation form as well as anything else you became aware of.
4. What effects did behavior have on student learning - include any effects on students visible/audible on tape (e.g. as I waited the student continued to struggle to produce an

answer) After the discussion the students' writing indicated that they had/had not listened to each other.

5. What would you change? How will you change it ? (specific strategies)

Products and grading

- | | |
|--|-----------|
| 1. Video recording, observation and analysis | 30 points |
| 2. Presentation of research to class | 20 points |
| 3. Observation, analysis, written discussion | 30 points |
| 4. Summary of experience for class | 20 points |

References:

Joyce, B. & Showers, B. (1995). Student Achievement Through Staff Development. (2nd ed.) New York: Longman.

Phillips, M. D., & Glickman, C. D. (1991). Peer Coaching: Developmental Approach to Enhancing Teacher

Thinking. Journal of Staff Development, 12(2), 20- 25

See “Resources for class assignments” section for a partial list of relevant research journal articles for improving classroom practice.

Presentations

You will present your reflections from the 3 projects. The presentations can be PowerPoint (or similar slideware), webpage or video.

SCHEDULE

(PLANS MAY CHANGE ACCORDING TO STUDENT NEEDS)

Class Meeting	Topic	Assignment Due	Reading Due
Jan 26	Introduction to class; Introduction to Taskstream; How to conduct interviews for assessment purpose; Sample interview from Private Universe tape; Parameters for Interview assignment		
Feb 2	Concept mapping; Using concept maps to assess understanding; Common naive conceptions in the physical and life sciences; Parameters for Improving Classroom Instruction Assignment.		Concept Mapping
Feb 8	Introduction to the Constructivist paradigm of teaching and learning: Nature of Science	Identify focus area for Improving	<ul style="list-style-type: none"> • Experts vs. Novices • Learning & Transfer • Effective Learning

		Classroom Instruction (ICI) Project	& Teaching
Feb 16	Present Interview reports; Plan for ICI Project; Data collection for ICI project; Learning cycle approach to instruction; Developing open-ended assessment questions; Observing and coding a teaching videotape	Alternative Concept Interview	Locate and read two journal articles related to your focus area for ICI project
Feb 22	How to develop a learning cycle; Conceptual change model		Embedded Assessment Concept Mapping the Learning Cycle
Mar 2	PBL, Case Study; Active Learning; Motivation	Develop, implement, design rubric and reflection on assessment questions	<ul style="list-style-type: none"> • How Children Learn • The Design of Learning Environments
Mar 9	Spring Break	Document current teaching with videotape and lesson plan (ICI)	
Mar 16	Questioning	Reflection on teaching video.	<ul style="list-style-type: none"> • Questioning • Authentic Assessment • Implementing the Learning Cycle
Mar 23	Piaget (concrete operations); Developing an improvement plan	Instructional Intervention of Alternative Concept assignment	Active Learning
Mar 30	Online Peer teaching Piaget (formal operations); Piaget, Learning Cycle, Conceptual Change Model: The connections.	Each student/group will choose a concept to teach on Blackboard Collaborate	Action Research
Apr 6	Diverse learners; learning styles; Gardner	Alternative	• Intelligent

		Conception Project	Teaching • Diverse Learners
Apr 13	No Class	Diverse Learners Project	
Apr 20	Presentations	ICI Project	
Apr 27	Presentations		

“Education is not a preparation for life; education is life itself.” - John Dewey

“It is impossible to deny that science has played a major part in determining the nature of the modern world. The food we eat, the clothes we wear, the means of transportation that we in going from place to place, the medicines that keep us well, the weapons we use in killing each other have been changed in recent years through scientific discovery. It may well be contented that the world is now in a dangerous situation because science and its application has developed faster than the understanding of the average citizen. It is evidently of great importance to attempt to improve this situation through a program of education of the citizen...The citizen must have knowledge enough of the world to make the right decisions; and in the modern world this means that the citizen must have a significant understanding of science.” Linus Pauling (1951)

Rubric for Improving Classroom Instruction Project

	Advanced	Proficient	Emerging	Points
Current Teaching Videotape, Observation and Analysis	Effective teaching strategy is clearly illustrated Effective teaching strategy corresponds to chosen literature	Effective teaching strategy is somewhat illustrated Effective teaching strategy is not entirely aligned with chosen literature	Not clear what teaching strategy is being illustrated	()/30
Presentation of Research to Class	Presentation of research is accurate and clear to the audience	Presentation of research is not entirely accurate OR presentation is not clear to the audience	Presentation of research is not entirely accurate AND presentation is not clear to the audience	()/20
Improvement Plan	Improvement plan is tangible, targets the teaching strategy, AND is developed collaboratively	Missing one or more of the following elements: Improvement plan is tangible, targets the teaching strategy, AND is developed collaboratively	Improvement plan is not tangible, does not target the teaching strategy, AND is not developed collaboratively	()/10
2nd Teaching Videotape, Observation and Analysis	Effective teaching strategy is clearly improved, Effective teaching strategy corresponds to	Effective teaching strategy is somewhat improved, Effective teaching strategy is not entirely	Not clear what changes have been made in the teaching strategy is being illustrated	()/30

	chosen literature Tape has both observation and analysis	aligned with chosen literature Tape has only observation or analysis		
Summary of Experience for Class	Summary is based on evidence of experiences AND demonstrates reflective practice	Summary is missing one of the following elements: Summary is based on evidence of experiences AND demonstrates reflective practice	Summary does not clearly demonstrate experiences	()/10